

CLAIMS

What is claimed is:

1. A device for studying at least one of cell migration and deformation comprising:
at least two channels defined in the device, the two channels being separated by a partitioning wall therebetween;
wherein each channel has an inlet and an outlet, and at least one through passage is defined in the partitioning wall to allow fluid communication between the two channels.
2. A device according to Claim 1, comprising three channels and two partitioning walls, each of which separates two neighboring channels.
3. A device according to Claim 1, comprising n channels and $n-1$ partitioning walls, each of which separates two neighboring channels.
4. A device according to Claims 2 or 3, wherein the channels lie in a common plane.
5. A device according to Claim 1, wherein at least two passages are defined in each of the at least one partitioning wall.
6. A device according to Claim 5, wherein the partitioning wall comprises:
two wall sections separated by a gap therebetween; and
at least one partitioning element in the gap that divides the gap to form the two passages.
7. A device according to Claim 6, wherein the partitioning wall comprises at least two partitioning elements that divide the gap into at least three passages.
8. A device according to Claim 7, wherein the partitioning wall comprises m partitioning elements that divide the gap into at least $m+1$ passages.

9. A device according to Claim 7, wherein the partitioning elements are at least substantially evenly spaced apart to form passages of at least substantially equal widths.

10. A device according to Claim 7, wherein the partitioning elements are unevenly spaced apart to form passages of widths that vary along the length of the partitioning wall.

11. A device according to Claim 10, wherein the widths of the passages increases along the length of the partitioning wall.

12. A device according to Claim 7, wherein the partitioning elements have one of a semi-circular, circular, polygonal and an elongated cross section.

13. A device according to Claim 12, wherein the elongated cross-section is rounded at at least one end thereof.

14. A device according to Claim 2, wherein the thickness of at least one of the partitioning walls is different than that of the other partitioning walls.

15. A device according to Claim 14, wherein the thicknesses of the partitioning walls are different from each other.

16. A device according to any of the preceding claims, wherein the device comprises:
a substrate whose surface has grooves that define the at least two channels and the at least one passage; and
a cover that is attached to the surface of the substrate.

17. A device according to Claim 16, wherein the substrate is molded using a biocompatible material.

18. A device according to Claim 17, wherein the biocompatible material is at least substantially translucent.

19. A device according to Claim 16, wherein the cover is of a biocompatible material.

20. A device according to Claim 19, wherein the biocompatible material is at least substantially translucent.

21. A device according to Claim 17, wherein the biocompatible material comprises one of glass, silicon and a polymerizable material.

22. A device according to Claim 21, wherein the polymerizable material is comprises a material selected from the group consisting of polycarbonate (monomer), polyacrylic (monomer), polyoxymethylene (monomer), polyamide (monomer), polybutylenterephthalate (monomer) and polyphenylenether (monomer), polydimethylsiloxane (PDMS) (monomer), mylar (monomer), polyurethane (monomer), polyvinylidene fluoride (PVDF) (monomer), flourosilicone (monomer) and combinations and mixtures thereof.

23. A method of manufacturing a device for studying at least one of cell migration and deformation:

providing a substrate;

forming a layer of photoresist on a surface of the substrate;

photolithographically forming grooves on the photoresist layer to define a mold;

using the mold to mold a substrate having structures defined by the grooves, the substrate having at least two channels formed on a surface thereof, the two channels being separated by a partitioning wall therebetween, wherein each channel has an inlet and an outlet, and at least one through passage is defined in each partitioning wall to allow fluid communication between the two channels; and

attaching a cover to the surface of the substrate.

24. A method of studying at least one of cell migration and deformation, said method comprising:

providing a device comprising at least two channels defined in the device, the two channels being separated by a partitioning wall therebetween, wherein each channel has an inlet and an outlet, and at least one through passage is defined in the partitioning wall to allow fluid communication between the two channels,

providing a fluid medium in at least one channel,

providing a test sample containing cells in the at least second channel,

and

studying the migration of cells through the at least one through passage.

25. The method of Claim 24, wherein providing fluid medium in at least one channel comprises:

filling the at least one channel with fluid medium,

then allowing the flow of fluid medium to achieve steady state in all channels, and

subsequently eliminating air bubbles that are present by drawing fluid medium from the outlet of the channel through which the sample containing cells is to be provided.

26. The method of Claims 24, wherein the flow rate of the fluid medium is controlled by hydrostatic pressure.

27. The method of Claim 24, wherein the test sample is delivered to the at least second channel under laminar flow conditions.

28. The method of Claim 24, further comprising determining cell migration velocity in a through passage.

29. The method of Claim 24, further comprising providing a cell migration promoter or inhibitor in at least one channel.

30. The method of Claim 24, wherein studying the migration of cells through the at least one through passage comprises:
- observing the migration of cells by an image capture device, wherein the image capture device is a still photographic camera or a video camera.
31. The method of Claim 24, further comprising determining the number of cells that migrate through the at least one through passage.